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CAUTION!

THERE ARE DANGEROUSLY HIGH VOLTAGES PRESENT INSIDE THE AMPLIFIER WHENEVER THE POWER SWITCH IS TURNED ON. DO NOT REMOVE THE TOP COVER UNLESS YOU EXERCISE THE UTMOST CAUTION. THE VOLTAGES FROM THE POWER SUPPLY CAN BE LETHAL!!!

The output relay in the 2004A is rated at 700 watts at 440MHz. You will burn the contacts of the relay if you operate any more than 700 watts for short periods of time and it will burn up the relay. Burned relay contacts are NOT covered by warranty!!! Operation at 1000 watts PEP output is within specification of the relay.

ATTENTION

Both the 2002A and the 2004A are capable of achieving substantially more power output than the CW rating shown in this manual. To achieve the listed PEP output, the amplifier by definition must be capable of short term continuous wave operation at the same level. You must resist the temptation to operate the amplifier at this level.

Several of the major components are subject to damage if the amplifier is operated above its rated levels. This is especially true of the 3CX800 A7 which is warranteed by Eimac only if it is operated as specified. Do NOT drive with more than 25 watts continous wave drive. Do NOT run more than 30 ma. grid current. Do NOT run more than 600 ma. continuous wave plate current. Do NOT operate the amplifier into greater than 1.5 to 1 SWR.

SECTION 1. SPECIFICATIONS

Type and Function of Equipment.

2002A - A desk top 2000 watt PEP input (1000 watts PEP nominal output) linear RF amplifier covering the 144 to 148 MHz frequency range. Versions of this amplifier are also available for special frequencies outside the amateur band.

2004A - A desk top 2000 watt PEP input (1000 watts PEP nominal output) linear RF amplifier covering the 430 to 450 MHz frequency range. Versions of this amplifier are also available for special frequencies outside the amateur band.

Type of Emission ..... SSB/FM/CW/AM/RTTY

Output Power ..... 1000 watts PEP nominal, 500 watts DC nominal.

Gain ..... 2002A: 15 dB nominal
2004A: 12 dB nominal

Dimensions ..... 9.5" high X 17.25" wide X 19.75" deep.

Shipping Weight ..... 75 pounds.

Duty Cycle ..... Full output in intermittent amateur service.

Power Requirements ..... 115 VAC at 30 Amps, 230 VAC at 15 Amps, 50/60 Hz.

Cooling ..... Forced air cooling

Frequency Range ..... 2002A: 144 to 148 MHz.
2004A: 430 to 450 MHz.
Special versions of both models are available for non-amateur use use on other frequency ranges.

Input Impedance ..... 50 Ohms nominal with tuned input circuit.

Tube Complement ..... Eimac 3CX800A7 ceramic triode.

Harmonic and Spurious Radiation ..... Harmonics: Better than 60 dB down with standard filter.
3rd Order Distortion: Better than -35 dB at full output.

Plate Voltage (Depends on AC line voltage.) ..... SSB: 2200 to 2600 VDC
FM: 1800 to 2200 VDC

Cabinetry ..... All aluminum cabinets, double shielded in RF section.

Antenna Relay System

2002A: Built-in 12 VDC antenna relays automatically transfer the exciter to antenna when the power switch is in the standby or off position. A built-in DC power supply offers hum-free operation. Relays supplied include a short throw input relay and a coaxial type output relay.

2004A: An optional 2-pole double throw coaxial type antenna relay can be factory installed. It is a 12 VDC relay which automatically transfers the exciter to the antenna when the power switch is in the standby or off position. A built-in DC power supply offers hum free operation.

Both amplifiers require a relay contact in the exciter to short the relay control jack to key the amplifier.

Metering ..... Plate current, plate voltage, and grid current.

Protection Devices ..... All circuits are protected by fuses or circuit breakers.

Accessories Supplied ..... RF drive cable, relay control cable, fuses, manual.

SECTION 2. INTRODUCTION

The 2002A and 2004A are high quality, one-stage linear RF power amplifiers which use a single Eimac 3CX800A7 ceramic high gain triode in a grounded grid circuit. Both amplifiers use simple strip-line construction in the output circuit; the 2002A uses a 1/4 wave strip-line, and the 2004A uses a 1/2 wave strip-line. The amplifiers are completely self-contained and employ only the highest quality RF and DC components for a long, trouble-free life.

For proper operation of these amplifiers you will require Bird or equivalent power measuring equipment capable of measuring up to 1000 watts in the appropriate frequency range. This equipment is not supplied with the amplifier.

Please read the instruction manual carefully before operating your new equipment. Power amplifiers, particlarly at this power level and frequency, can easily be damaged by improper operation. The amplifiers are shipped completely assembled with the tubes installed and are ready for use after the installation of an appropriate power plug. Please carefully observe the following precautions at all times when you are using this equipment.

CAUTION

There are dangerously high voltages present inside the amplifier whenever the power switch is in the ON position. Always exercise the utmost caution when you must remove the top cover. THE VOLTAGES FROM THE POWER SUPPLY CAN BE LETHAL!

The 3CX800A7 is a high gain tube capable of almos 16 dB of gain under certain conditions. Because of these characteristics the tube can easily be driven beyond its specifications. The maximum tube parameter specifications are as follows:

Grid Current:	40 ma maximum
Plate Current:	800 ma for SSB operation
	600 ma for CW or FM operation.

If you exceed these specifications the tube can be damaged and this danage may not be covered by the tube's warranty.

The output relay in the 2004A is rated at 700 watts DC at 440 MHz. You will burn the contacts of the relay if you operate any more than 700 watts. The 2004A is capable of output in excess of 700 watts for short periods of time and it will burn up the relay. Burned relay contacts are not covered by warranty. Operation at 1000 watts PEP output is within specification of the relay.

SECTION 3. INSTALLATION

SECTION 3.1 UNPACKING

Remove the amplifier from its shipping carton and packing material. Please note that the manual, cables, and other accessories should be packed in the box also, so do not throw them away. Examine the box and the amplifier carefully for shipping damage. If there is any shipping damage, save the box and packing material and notify the transportaion company immediately. It is a good idea to save the box and packing in any case because they are expensive to replace and are useful to protect the equipment should you ever decide to ship it or move it to another location. The amplifier is shipped with the tube installed and completely assembled except for the power plug.

The following are included as accessories:

1 Manual and Warranty card
1 RF Input Cable
1 Box 3 AG 1.5 amp Fuses
1 Relay Control Cable

SECTION 3.2 OPERATING LOCATION

The amplifier may be located wherever desired provided there is adequate air flow around the cabinet. Do not enclose the cabinet or restrict air flow. You will require a location that has an appropriate AC power source. Choose an operating position which avoids environmental extremes of heat, humidity, and dust to keep the amplifier looking new and to ensure years of reliable operation.

SECTION 3.4 CABLING

Each of the following cables must be connected before the amplifier can be used properly.

POWER CABLE: The standard amplifier comes from the factory equipped with a 3-wire AC power cable which must be connected to a 115 or 230 VAC, single phase, 50 or 60 Hz power source. The amplifier is not supplied with an AC plug because of the variety of socket types available for AC use. It is your responsibility to obtain and correctly connect the AC plug to your amplifier.

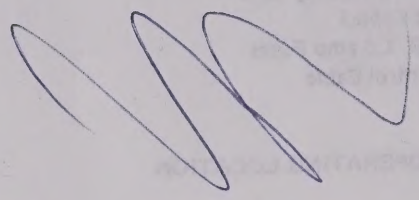
Figure 1 shows the wire connections and also shows how the terminal block on the back of the amplifier can be rejumpered for 115 VAC operation. All standard amplifiers are shipped from the factory wired for 230 VAC operation unless otherwise specified. The terminal board for changing the AC line voltage is located behind a small cover on the back panel. Operation from a 230 VAC line, whenever possible, is preferred because the voltage regulation is better and the current is lower.

Please remember that the amplifier can be damaged if the wires are connected incorrectly. Disconnect the power cord from the source before making any changes in the cord or terminal board. Damage caused by incorrect AC connection or operation from a power source out of specification will not be covered by the warranty!

OUTPUT COAX: You must select a coax type appropriate for the power level and frequency at which you are operating. Any 50 Ohm coax capable of carrying 500 watts or more at 146 Mhz or 440 MHz is appropriate. Standard RG-8/U or RG-213/U will probably work at 146 MHz, but heliax or teflon coax will probably be required at 440 MHz. A type N coax connector is used for the amplifier output. You must supply a type N coax connector to connect the amplifier.

NEVER OPERATE THE AMPLIFIER WITHOUT A 50 OHM ANTENNA OR DUMMY LOAD. Do not operate your amplifier into a load with an SWR of greater than 2:1. Measure the SWR of your antenna with an SWR meter using only your exciter before operating the amplifier. With the antenna turned off, the exciters output goes directly to the antenna. You can damage the amplifier if you operate into a load with an SWR greater than 2:1.

To properly tune your amplifier you will need a Bird or equivalent wattmeter in the output and input lines to monitor your drive level and output power.



INPUT CABLE: A BNC type coax connector accepts the drive from your exciter. You must connect an appropriate 50 Ohm coax line between your exciter and the amplifier. An SWR meter will be required in the drive line to properly adjust the input tuning and drive level of the amplifier.

RELAY CABLE: A grey relay control cable is supplied in your accessory kit. This must be plugged into the RCA socket marked RELAY CONTROL on the back panel of the amplifier. This cable conducts the keying signal from the exciter to switch the amplifier to the transmit condition and must be plugged into the socket marked ANTENNA RELAY (or the equivalent) on the exciter. The RCA connector must be removed if your exciter requires a solder type connection. The exciter needs to supply only a shorting relay contact during transmit to key the amplifier.

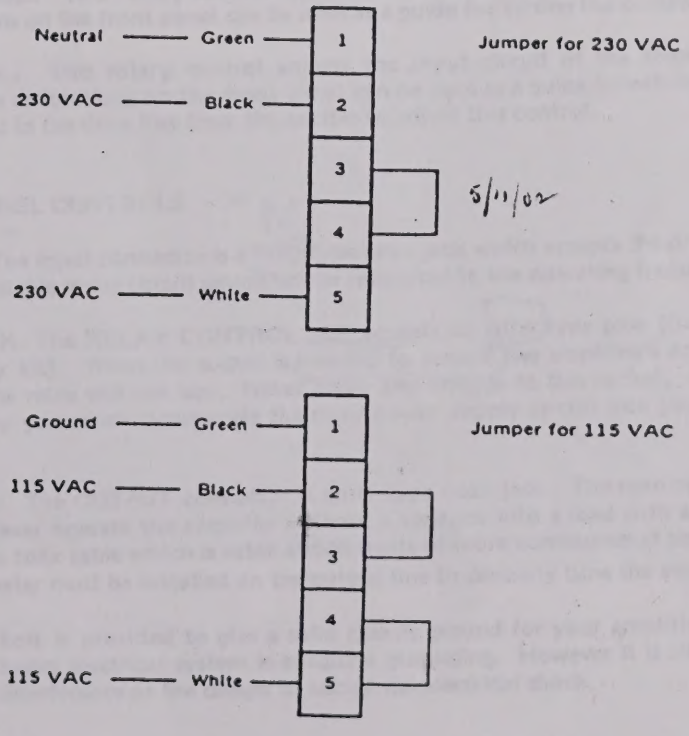
Never apply any voltage to the amplifier's relay control jack. Your amplifier has a built-in relay power supply which provides the necessary voltage.

Most modern exciters make provision for a relay control connection. If it is not obvious to you, examine the operating manual of the exciter to find an availabe unused relay contact that is normally open during receive and normally closed during transmit.

Some modern exciters use diode switching rather than relay switching. Since all Henry amplifiers use a 12 VDC relay control voltage, any resistance across the relay control line may keep the amplifier from keying. If your exciter will not key the amplifier, you should check the resistance across the contact you are using. If there is too much resistance, contact the exciter's manufacturer about possible solutions to the problem.

GROUND: The amplifier has a ground stud on the back panel. We suggest that you connect a solid earth ground to the amplifier to prevent any shock hazard from the equipment.

FIGURE 1. AC LINE VOLTAGE CONNECTIONS.



SECTION 4. OPERATING CONTROLS

SECTION 4.1 FRONT PANEL CONTROLS

POWER SWITCH: This circuit breaker switch is used to turn the amplifier on and off. It is also a circuit breaker for overload protection on the AC lines. When the amplifier is turned off or in the standby position the output from the exciter passes through the amplifier directly to the antenna.

FUNCTION SWITCH: This four-position pushbutton switch is located just below the meters. It has two interlocked switch pairs. The two on the left select the function of the multimeter. When the far left button (IG) is pushed in, the multimeter reads the grid current of the final tube on a 0 to 40 ma scale. When the second button (HV) is pushed in, the multimeter reads the high voltage from the power supply on a 0 to 4000 VDC scale. The pair of switches on the right side enables or disables the amplifier. When the standby (STBY) switch is selected the amplifier will not key during transmit so you can use your exciter "barefoot" without turning off the power switch of the amplifier. When the operate (OP) switch is selected the amplifier will automatically key during transmit.

MULTIMETER: The bottom meter shows either the grid current of the final tube on a 0 to 40 ma scale or the high voltage from the power supply on a 0 to 4000 VDC scale. The two left buttons on the function switch select the reading on the multimeter.

PLATE CURRENT METER: The top meter monitors the plate current of the 3CX800A7 tube on a scale of 0 to 600 ma. Nominal plate current during FM or CW key-down operation would be less than 550 ma. Nominal plate current during voice peaks at the 2KW PEP level is less than 250 ma.

SSB/FM SWITCH: This two-position rotary switch selects between two taps on the high voltage tansformer to assure correct loading and output for each type of emission. The FM position can be used for CW, FM, RTTY, or AM operation. It is also used for tuneup for SSB service. The amplifier can be damaged if the higher plate voltage in the SSB position is used for these other positions or for tuneup. Never turn this switch while the amplifier is keyed--you will damage the switch!

STANDBY LIGHT: The yellow standby light is lighted when the amplifier is on and the function switch is in the standby position. There is a 120 second warmup delay circuit in your amplifier. When it is first turned on there will be a two minute delay before the lights come on. The amplifier cannot be keyed until the lights come on.

POWER LIGHT: The red power light is lighted when the amplifier is turned on and the function switch is in the operate position. The amplifier must warm up for two minutes before the lights will come on.

OUTPUT TUNE CONTROL: This rotary control adjusts the strip-line tank circuit to resonance at the operating frequency. The calibrations on the front panel can be used as a guide for setting the control.

INPUT TUNE CONTROL: This rotary control adjusts the input circuit of the amplifier to resonance at the operating frequency. The calibrations on the front panel can be used as a guide for setting the control. A through-line SWR meter is required in the drive line from the exciter to adjust this control.

SECTION 4.2 REAR PANEL CONTROLS

INPUT CONNECTOR: The input connector is a BNC type coax jack which accepts the drive cable from the exciter. The amplifier has an adjustable input circuit which can be resonated to the operating frequency.

RELAY CONTROL JACK: The RELAY CONTROL jack accepts an RCA type plug (there is a relay control cable supplied in the accessory kit). When the socket is shorted to ground the amplifier's antenna relay closes. If the amplifier is turned off the relay will not key. Never apply any voltage to this socket. If the 2004A is purchased without an antenna relay you must incorporate the relay power supply circuit into your own relay system. The voltage is 12 VDC.

OUTPUT CONNECTOR: The OUTPUT connector is an N type coax jack. The nominal output impedance of the amplifier is 50 ohms. Never operate the amplifier without a load, or into a load with an SWR more than 2:1. Use only high quality 50 ohm coax cable which is rated at 500 watts or more continuous at your operating frequency. A Bird or equivalent wattmeter must be installed on the output line to properly tune the amplifier.

GROUND LUG: This bolt is provided to give a solid chassis ground for your amplifier. Usually connecting the amplifier to a standard 3-wire electrical system is adequate grounding. However it is still a wise idea to ground the unit to prevent radiated interference or the danger of accidental electrical shock.

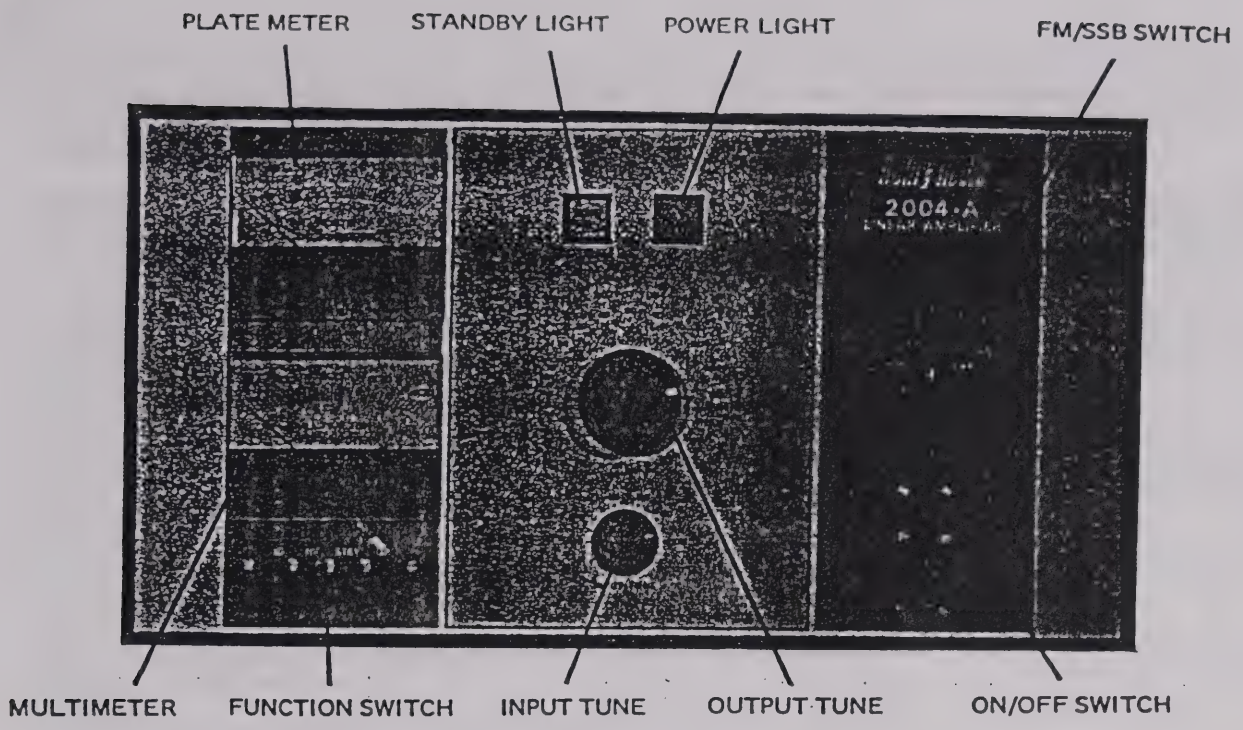
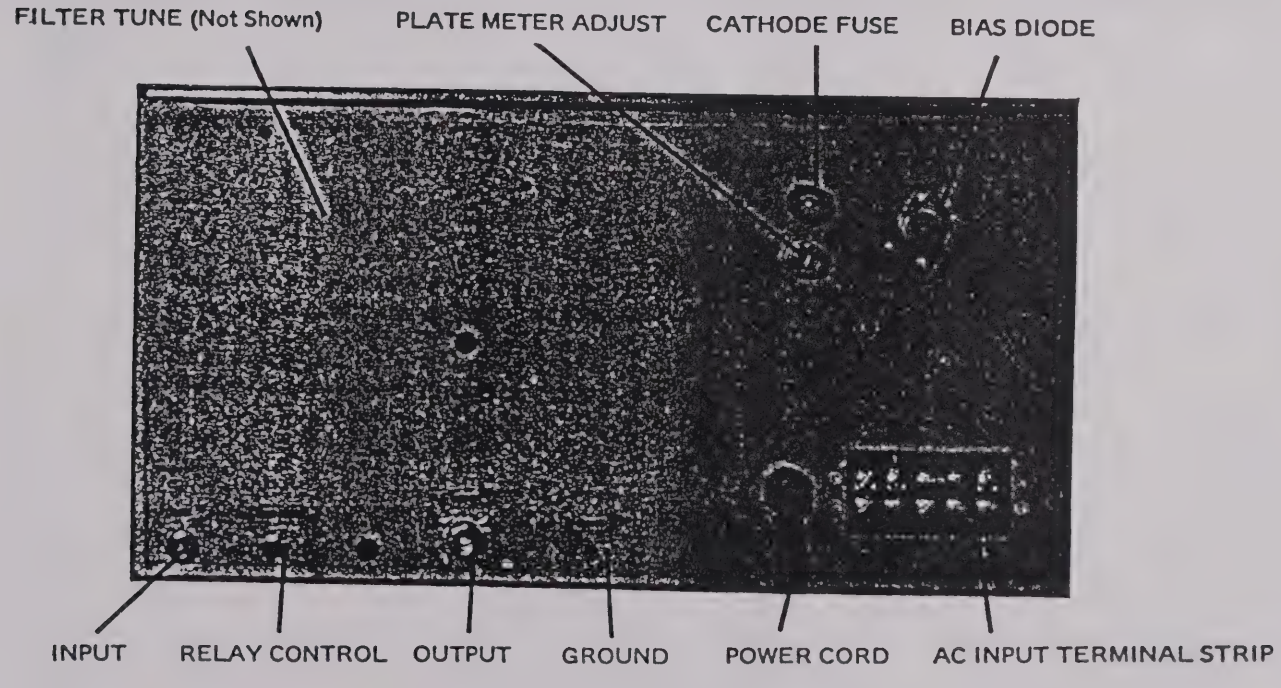
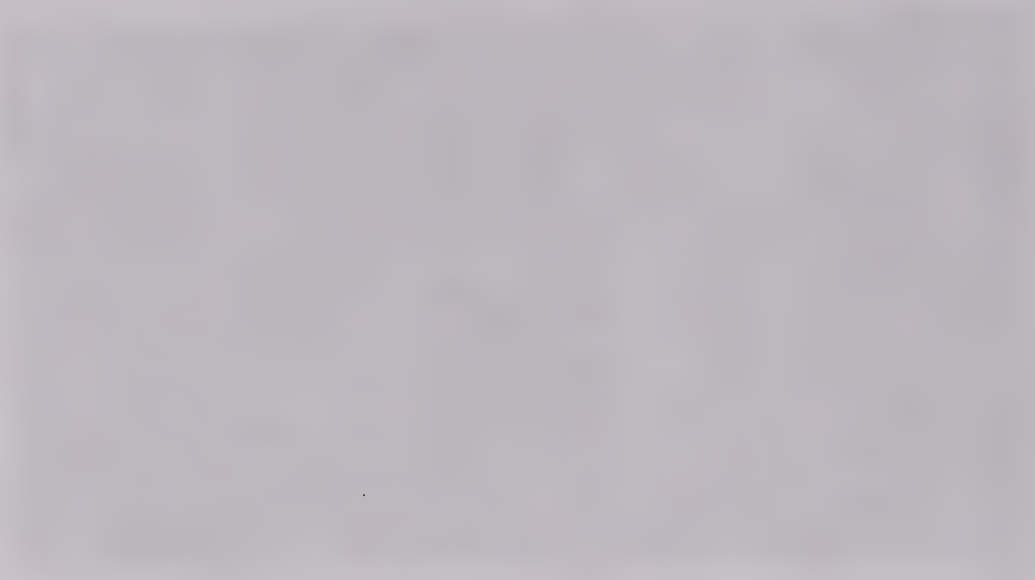
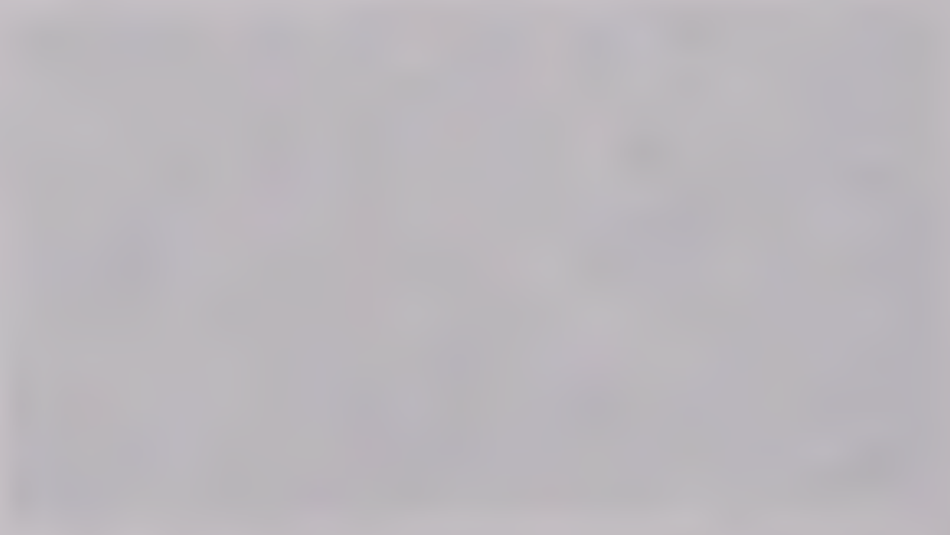


FIGURE 2. OPERATING CONTROLS







POWER CORD: The power cord must be connected to an appropriate power source as discussed in the installation section. No plug is provided on the 10 foot cord. Be certain that the power transformer is jumpered correctly for the desired AC voltage before connecting the plug. See Figure 1. All amplifiers are factory wired at 230 VAC operation, single phase, 3-wire AC systems unless otherwise requested.

AC POWER CONNECTION TERMINAL BOARD: This terminal board is located behind a cover on the rear panel. Connect the jumpers on this terminal strip for the desired AC voltage as shown in Figure 1. For 230 VAC operation, pins 3 and 4 should be jumpered. For 115 VAC operation pins 2 and 3 and pins 4 and 5 should be jumpered.

FILTER TUNE CONTROL: This rotary control resonates the strip-line output filter to the operating frequency. The filter has a bandwidth of about 400 Khz so once it is tuned the amplifier can be operated approximately plus or minus 200 KHz from the center frequency without retuning. At frequencies beyond 200 KHz the filter must be resonated again.

Please note that the filter is wired so that it is in the circuit whether or not the amplifier is keyed. This way it can act as a receiver preselector filter for added selectivity. However if you are receiving over a wide range of frequencies and do not care to retune the filter all the time, you will have to rewire the coax fittings so that the filter is between the RF Section and the antenna relay.

PLATE METER ADJUST POTENTIOMETER: This potentiometer is factory adjusted before shipment and should not require any adjustment. A special high voltage ammeter is required to adjust the circuit.

3 AG, 1.5 AMP FUSE: This fuse protects the cathode circuit from overload or short circuit. Never replace the fuse with one of greater current rating.

1N2804A: This is the bias diode for the final tube.

SECTION 4.3 INTERNAL CONTROL

LOAD CONTROL: This is a screwdriver adjust control located on the top of the RF section of the amplifier. To access this control you must remove the top perforated screen of the cabinet by unscrewing the four counter-sunk screws (one in each corner). This control matches the output of the amplifier to your antenna and most likely will require adjustment only when the amplifier is installed in its operating location or when you change your antenna. This control is adjusted with the plate voltage on so you must exercise extreme caution to avoid the 2000 VDC plate voltage!

SECTION 5. OPERATION

SECTION 5.1 SET-UP

After connecting all of the necessary cables as previously described, turn the amplifier on and set the SSB/FM switch to the FM position. Push the standby button on the function switch so that the amplifier is in the standby mode. The warmup delay relay in the amplifier takes approximately 120 seconds to connect the 12 VDC relay and pilot light voltage. The standby light will come on as soon as the amplifier has warmed up. The blower should come on when the power switch is turned on. Place your hand above the top screen of the amplifier to verify that air is flowing through the tube. Make sure the top and sides of the amplifier are clear of objects that would restrict air flow.

With the amplifier off, in the standby mode, or in the warmup mode, the exciter is connected directly to the antenna transmission line. Push the HV button on the function switch so that the multimeter is showing the high voltage in the amplifier. The reading (depending on the AC line voltage) should be between 180 and 220, indicating a plate voltage of 1800 to 2200 VDC. The high voltage transformer has taps for 100, 110, 120, 200, 220, or 240 VAC. If the plate voltage is outside the specified range the high voltage transformer will have to be rewired for the proper AC line voltage.

Push the OP button on the function switch so that the amplifier is switched into the operate mode. With the amplifier keyed (relays closed) but no RF drive applied from the exciter the plate current should show a resting current between 20 and 30 ma (in the FM position). This resting current varies with individual tubes and the value of the high voltage.

SECTION 5.2 TUNE-UP

BIRD WATTMETER TED

An SWR meter is required in-line with the drive cable and a Bird or equivalent wattmeter is required in-line with the output cable to properly tune this amplifier. A dummy load or antenna must be connected to the amplifier. Once the amplifier is resonated to frequency and to your antenna the meters can be removed. If you operate on many different frequencies you should keep the meters in line all the time. Set the filter tuning at minimum reflected power point with only the exciter operating (amplifier should be in standby mode).

Set your exciter up for operation at the desired frequency. Set the amplifier selector switch to the FM position. Initial tuning of the amplifier should be accomplished with only 5 to 10 watts drive so that it can be brought to resonance with no chance of damaging the amplifier. If your relay control cabling is set up correctly you should hear the relays key as soon as you push the exciters PTT button. If the relay is not keying you will have to check the wiring of the relay circuit.

Key the exciter to drive the amplifier with 5 to 10 watts. Carefully adjust the INPUT TUNE control to minimize the SWR between the exciter and the amplifier. Next carefully adjust the OUTPUT TUNE control to dip the reading on the plate current meter for maximum output power.

There is a screwdriver adjust LOAD control inside the cabinet. As a last step you should adjust this control for maximum output. The LOAD control matches the amplifier's output stage to your antenna. This control should only need to be adjusted on installation of the amplifier, not during normal operation. You must remove the perforated top screen of the cabinet to access the control. Exercise EXTREME caution when adjusting this control! The plate voltage is turned on and is very dangerous!

Please be careful how long the amplifier is keyed during tuning. The power supply or tube can be damaged by operation for long periods in a non-resonant condition.

SECTION 5.3 FM OR CW OPERATION

Increase the output from the exciter to drive the amplifier to the desired output power keeping in mind the following limitations on the operating parameters of the tube. Maximum plate current is 600 ma and maximum grid current is 40 ma. Carefully readjust the OUTPUT TUNE control for maximum output.

Typical operating conditions are:

Plate Voltage	2000VDC
Plate Current	.550 ma
Power Input	1100 watts
Power Output	600 watts
Drive Level	.22 watts
Grid Current	20-25 ma

The plate dissipation of the 3CX800A7 is 800 watts, and the tube can be damaged if that figure is exceeded. The plate dissipation can be calculated by subtracting the output power from the input power (plate voltage x plate

240 DANIEL

current). For example, during tune up if the plate current is 400 ma with 2000 VDC plate voltage and the output is zero (before you have tuned to resonance) the plate dissipation is 800 watts. Be careful not to exceed 400 ma plate current during tuning.

When the amplifier is properly tuned, the efficiency should be around 55% or better. Therefore with 1000 watts input power (2000 VDC at 500 ma) your output should be about 550 watts.

SECTION 5.4 SSB OPERATION

After the amplifier has been tuned to resonance as described above switch the exciter and then the amplifier should be in the SSB mode. The plate voltage of the amplifier should be about 400 VDC higher than in the FM mode. Increase the mike gain on the exciter until the amplifier's plate current reading is about 250 ma on voice peaks. The grid current meter should show about 10 ma at full amplifier output. Because of the complex wave form of the human voice, 250 ma on the plate current meter is actually 800 ma for voice peaks. Neither the amplifier nor its power supply are designed for operation at 800 ma plate current. Under no circumstances should the plate meter read in excess of the rated 600 ma maximum plate current after tuning in the FM position, as described in section 5.3. The amplifier is tuned for optimum SSB operation in the SSB mode. Do not tune the amplifier in the SSB mode.

SECTION 5.5 OPERATING PRECAUTIONS

Keep the following operating precautions in mind to insure safe and reliable operation of your amplifier for many years.

Voltages inside the amplifier can be lethal. Never try to disable the protection circuits or to operate your amplifier without its cabinet or top cover.

Always tune your amplifier at low output for resonance at the operating frequency before transmitting.

Never operate the FM/SSB switch while the amplifer is transmitting. You will have an expensive repair if you do this.

Never operate your amplifier into a load or antenna with an SWR which exceeds 2:1.

The components in your amplifier are specifically designed for operating parameters in line with the rated output as listed in the specifications. Excessive drive causing output in excess of specification will shorten tube life and endanger the reliability of other components.

Specifically, the output relay in the 2004A is rated at 700 watts DC at 440 MHz. You will burn the contacts of the relay if you operate any more than 700 watts. The 2004A is capable of output in excess of 700 watts for a short period of time and it will burn up,the relay. Burned relay contacts are NOT covered by warranty! Operation at 1000 watts PEP output is within the specifications of the relay.

SECTION 6. MAINTENANCE PROBLEMS

SECTION 6.1 TUBE PROBLEMS

EXCESSIVE PLATE CURRENT: This symptom is usually caused by a defective 3CX800A7 tube, and the only cure is to replace the tube. Be certain that the tube is tuned to resonance before deciding that the plate or grid currents are incorrect. Excessive resting plate current can often be caused by a failure of D9, the bias diode. Replace the diode to solve the problem.

GRID / CATHODE SHORT: A failure of this nature in the 3CX800A7 can cause the amplifier to show plate current even when it is not keyed. Another indication of this problem is negative grid current on the meter. Again, the tube must be replaced in order to correct the problem.

PLATE SHORT: A failure of this nature will cause the circuit breaker to blow. Other high voltage shorts can cause the same symptom so you must isolate the cause. You can confirm that the short is in the RF section by disconnecting the high voltage lead to the RF deck. If the circuit breaker stops blowing then the problem is in the RF section. If the shorted condition causes excessive plate current, the cathode fuse will blow.

LOW OUTPUT: A 3CX800A7 can offer years of reliable service, but if you operate the amplifier out of resonance the tube will eventually go "soft" making it impossible to drive the amplifier to full output. The 3CX800A7 offers extremely high gain (13 to 16 dB) when it is operating properly. The gain figure tends to drop at higher frequencies, and varies from tube to tube, but when operating properly the amplifier should put out about 20 to 40 times the drive power. Filament voltage should be maintained at 13.5 volts ± 0.6 volts.

SECTION 6.2 RELAY CIRCUIT PROBLEMS

RESTING CURRENT WHEN THE AMPLIFIER IS NOT KEYED: If the relay is keyed you will see normal tube resting current. Therefore you must suspect the relay cable, exciter relay, or one of the antenna relays is malfunctioning. Isolate the problem by disconnecting the relay cable. If the problem persists, the the cause is in the amplifier. If the problem disappears the cause is in the exciter or cable. A problem in the amplifier would normally be caused by a short in the 12 VDC relay supply circuit or a defective relay.

THE AMPLIFIER WILL NOT KEY: Suspect first the relay cable, then check the exciter's relay circuit. Henry amplifier's key with 12 VDC and some modern exciters use diode switching. This combination sometimes causes a voltage drop in the relay line so that the relays will not key. Measure the resistance across the exciter's relay contact. Any resistance can cause a voltage drop. If this is the case, a higher voltage external relay may be required or a modification might be required to the exciter. Another cause could be that the relay power supply is not providing the 12 VDC. Check the voltage at the center pin of the relay control jack; it should be between 12 and 20 VDC. The last possible cause of the problem could be a defective relay.

SECTION 6.3 HIGH VOLTAGE PROBLEMS

The high voltage in your amplifier can be lethal! Always disconnect the amplifier from its AC power source and turn off the power switch before repairing it.

NO PLATE CURRENT WITH HIGH GRID CURRENT: This is a sure sign that there is no high voltage at the tube. You will have to trace the high voltage circuit with the amplifier turned off to determine if there is a break in the wiring or if a defective component is causing the problem.

HIGH VOLTAGE SHORT: A high voltage short will usually result in the circuit breaker turning the amplfier off. Also there will often be an arc indicating the source of the short. Isolate the short by disconnecting the high voltage lead between the RF section and the power supply. If the short persists, the problem is in the power supply. If the short disappears, the problem is in the RF section. If the short is in the RF section, remove the top cover and search for visible evidence. Then use an ohm meter to trace the circuit from the high voltage input socket to the blocking capacitors, including the tube. If the problem exists in the power supply you will again have to use an ohm meter to trace the circuit to find the location of the short. Bad rectifier diodes can often be isolated by measuring their resistance. Good diodes have infinite reverse resistance and bad diodes have very low reverse resistance. Some of the components such as the transformer, filter capacitors, and diodes may only short when the high voltage is applied. To isolate the problem you will have to progressively disconnect components from the circuit until the short no longer happens. Start with the filter capacitor bank, progress to the diodes, then the power transformer. Remember that a short in the RF section may require replacement of the cathode fuse.

LOW HIGH VOLTAGE: The problem is often an indication of low AC line voltage. It can also be caused by a defective resistor in the filter capacitor bank.

EXCESSIVE HIGH VOLTAGE: This problem can be caused by high AC line voltage or by a short in the primary of the high voltage transformer. A transformer short would also cause the filament voltage to increase. Section 6.6 describes the necessary tap adjustments on the transformer to adjust for AC line voltage variations.

NO HIGH VOLTAGE METER READING: The most likely cause of this problem is a failure or value change in the high voltage multiplier resistor in the power supply section.

SECTION 6.4 BLOWER PROBLEMS

The blower is one of the parts most susceptible to transportation damage. Henry amplifiers use squirrel cage blowers because of their exceptional air blowing capability in a small size. But the blower assembly can be easily damaged if the amplifier is dropped during shipment. Therefore when the amplifier is installed make certain that a strong flow of air is coming out the top of the amplifier when it is turned on. Another indication of blower damage can be resonance in the amplifier's cabinet caused by an unbalanced blower. The blower may not operate if the AC line cord is improperly connected so check your line cord if the blower is not operating.

SECTION 6.5 OUTPUT PROBLEMS

If there is low output, the first thing to check is whether or not there is sufficient drive from the exciter. The 3CX800A7 will give 13 to 16 dB of gain (about 20 to 40 times the drive power) when it is operating properly. Some modern exciters have power drop off on certain frequencies so therefore the output power of the amplifier will also drop off accordingly since it is a superbly linear amplifier.

The next thing to check is the input and output cabling. An intermittent or shorted drive cable can cause low input or no input to the amplifier. This will usually show up by operating the exciter through the amplifier (in standby) and measuring the power. Low drive can be seen as low grid current during transmission. Also check the output cables. Shorted coax is not uncommon and a poor job of installing coax connectors (especially at these frequencies) can cause severe output problems.

Other problems that can reduce output are low plate current, insufficient filament voltage (nominal 12.9 to 14.1 VAC), low AC line voltage, or a bad tube.

SECTION 6.6 AC LINE VOLTAGE

The high voltage transformer in your amplifier has taps to compensate for unusual AC line voltage at the operating location. Normally the transformer is wired for 230 VAC operation. If your AC line voltage is far different from the norm then most of the operating parameters will be different. The transformer has taps for 100, 110, 120, 200, 230, 250 VAC operation. The taps should be wired as follows:

100 and 200 VAC	Taps 1 and 2	Taps 5 and 6
110 and 220 VAC	Taps 1 and 3	Taps 5 and 7
120 and 240 VAC	Taps 1 and 4	Taps 5 and 8

SECTION 6.7 OTHER PROBLEMS

BLOWER TURNS ON BUT LIGHTS WILL NOT COME ON: RY1 is a warm-up delay relay to protect the tube. If the relay is defective or comes out of its socket the relay control circuit and pilot light circuit will not close and the amplifier will not key. If the relay is working properly then there is a problem in the relay power supply.

AMPLIFIER CAN NOT BE TURNED ON OR OFF: The most likely cause is the circuit breaker. Check the continuity of the circuit breaker with an ohm meter if the unit can not be turned on or off. Another possible cause is improper installation of the power plug on the power cable.

SECTION 6.8 CONTACTING THE FACTORY

If you have any questions concerning the servicing of your amplifier, you should call or write the amplifier service department at Henry Radio. Should it ever be necessary to return the amplifier to the factory for repair, decide first if you need to send the whole amplifier or just a certain section. Next pack the equipment in proper packing material to prevent shipping damage. Include a short letter describing the exact problem. Insure the package for its value and ship it to our amplifier service department.

SECTION 7. DISASSEMBLING THE AMPLIFIER

The description of this procedure involves screws which are numbered on the accompanying figure, so refer to the diagram as necessary.

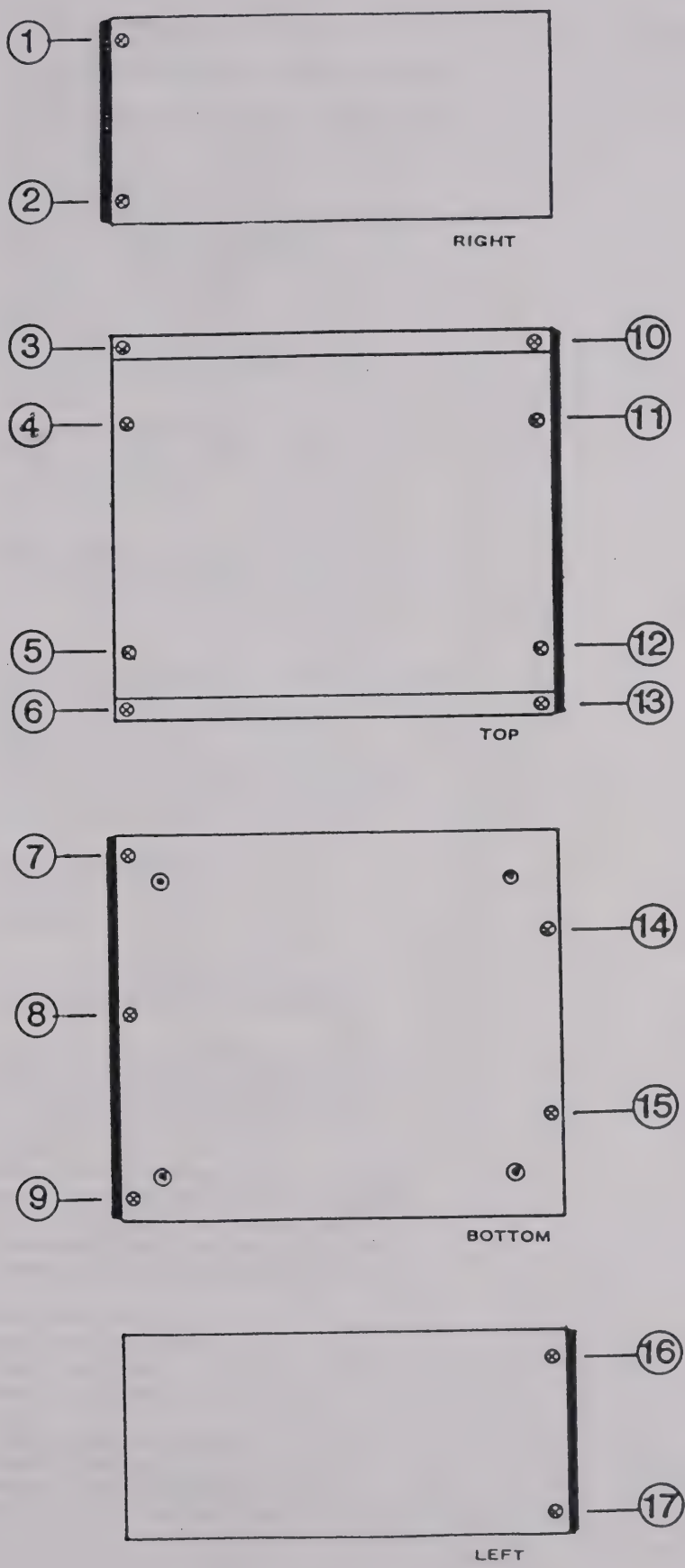
REMOVE TOP SCREEN: The painted perforated top screen is removed by unscrewing screws 4, 5, 11, and 12 and lifting off the top panel.

REMOVE THE BACK PANEL: The back panel is secured by screws 14 and 15 on the bottom of the amplifier and by two screws on the top (not shown in the diagram). Remove these four screws and the back panel should be free from the cabinet.

DISCONNECT CABLES: The harness from the front panel must be disconnected from the interconnecting terminal strip in the power supply section before the amplifier plate will slip free of the cabinet.

REMOVE THE KNOBS AND SWITCHES: Before the amplifier plate will come free of the cabinet you must remove the INPUT TUNE knob, OUTPUT TUNE knob, and FM / SSB knob and switch and unscrew the four screws holding the ON / OFF circuit breaker onto the front panel.

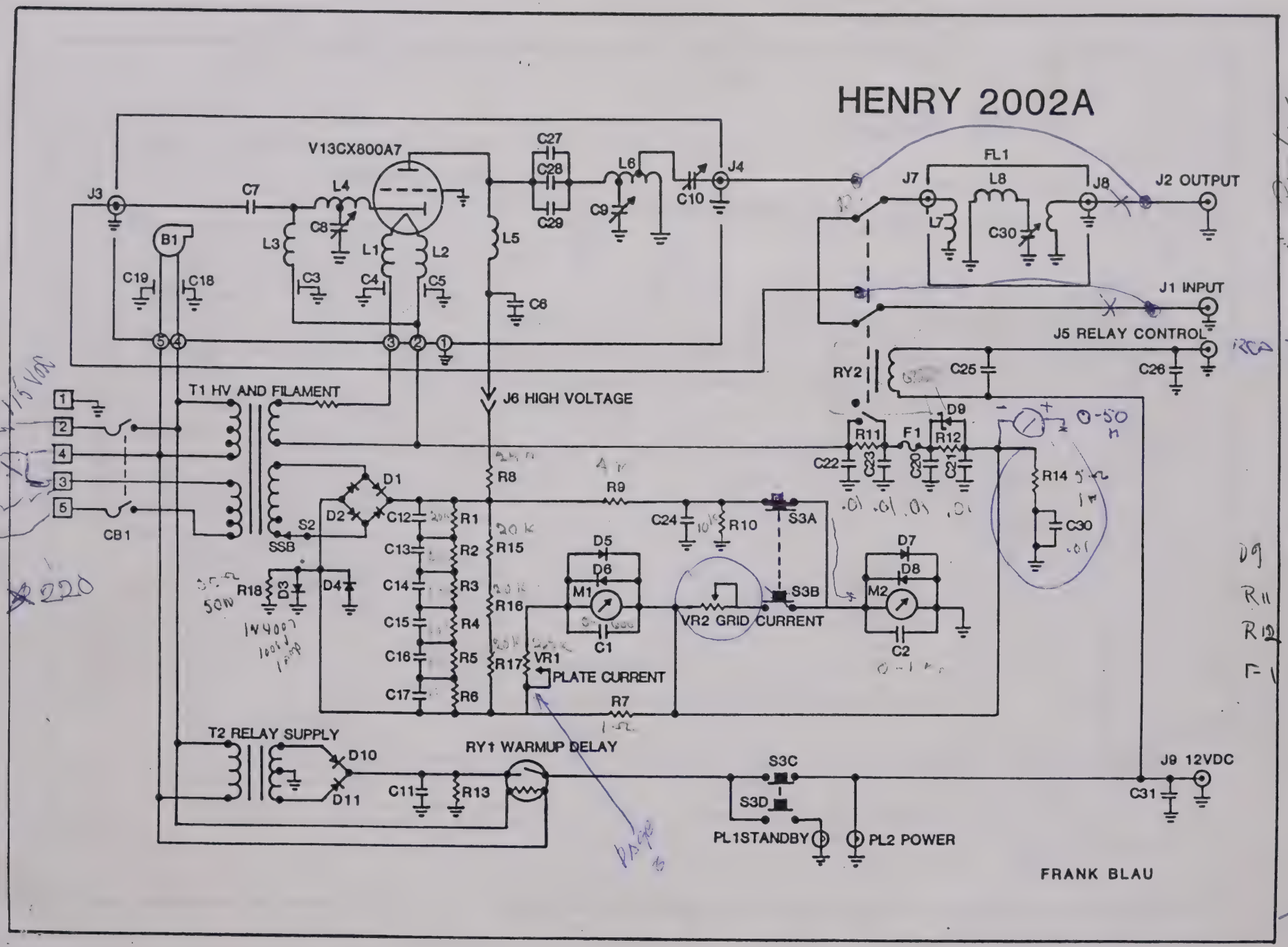
FIGURE 11. DISASSEMBLING THE DESK MODEL



SECTION 8. PARTS LIST

B1	Blower	Ripley BV2175
CB1	Circuit breaker ON / OFF switch.	Potter Brumfield W92X112—20
C1	Capacitor: Ceramic Disc, 0.01 mf, 600 VDC	Centralab DD6—103
C2	Same as C1.	
C3	Capacitor: Feedthrough, 200 pf, 500 VDC	Erie 202M
C4-C5	Same as C3.	
C6	Capacitor: Ceramic Transmit, 1000 pf, 5 kv	ITT Jennings 700002
C7	Capacitor: Same as C6	
C8	Capacitor: Input tune, Air Variable, 15 pf, 500 VDC	Henry
C9	Capacitor: Output tune, 2002A	Henry C9-2002A
C9	Capacitor: Output tune, 2004A.	Henry C9-2004A
C10	Capacitor: Load, 2002A	Henry C10-2002A
C10	Capacitor: Load, 2004A	Henry C10-2004A
C11	Capacitor: Electrolytic, 470 mf, 50 V	Arco ME—470—50
C12	Capacitor: Electrolytic, 180 mf, 450 V.	Cornell FAHM—180—450A3
C13-C17	Capacitor: Same as C12	
C18-C19	Not used	
C20-C26	Capacitor: Same as C1.	
C27	Ceramic Transmit, 100 pf, 7.5 KV	ITT Jennings
C28-C29	Capacitor: Same as C2.	
C30	Capacitor: Same as C1.	
	Cable: N male to N male.	Henry
	Cable: N male to BNC male.	Henry
	Cable: N male to bare coax	Henry
D1	Diode: High voltage rectifier, 1.2 amps. 15 KV.	CSDC 423PD10AE1
D2	Diode: Same as D1	
D3	Diode: Rectifier: 1.0 Amps, 400 PIV	Motorola 1N4004
D4-D8	Diode: Same as D3	
D9	Diode: Zener, Bias Diode.	Motorola 1N2804A
D10	Diode: Silicon rectifier, 1 amp, 1000 PIV.	GE 509
D11	Diode: Same as D10.	
F1	Fuse: 3 AG, 1.5 amp.	Littlefuse 312 001.5
	Fuseholder: 3 AG	Littlefuse 348 875
	Feet: Rubber	Accurate Rubber BA2096
FL1	Filter: 2002A 146 MHz Stripline type.	Henry FL1-2002A
FL1	Filter: 2004A 440 MHz Stripline type.	Henry FL1-2004A
J1.	Connector: RF input BNC Type coaxial	Amphenol UG-647/U
J2.	Connector: RF output N Type coaxial	Amphenol UG-58A/U
J3.	Connector: RF section input Type BNC	Amphenol UG-647/U
J4.	Connector: RF section output Type N	Amphenol UG-58A/U
J5.	Not used	
J6.	Connector: High Voltage	Millen 37501
J7.	Connector: 2002A Filter section Type UHF.	Amphenol SO-239J7
J7.	Connector: 2004A Filter section type N	Amphenol UG-58A/U
J8.	Connector: 2002A Filter section Type UHF.	Amphenol 20-239
J8.	Connector: 2004A Filter section Type N	Amphenol UG-58A/U
	Knob: Filter Tune	Raytheon 70-2-2G
	Knob: FM / SSB switch	Raytheon 70-7WL-2G
	Knob: Input tune	Raytheon 70-7WL-2G
	Knob: Output tune	Raytheon 175-1-2G
L1	Inductor: Filament choke	Henry L1-2002A
L2	Inductor: Same as L1.	
L3	Inductor: 2002A, cathode choke	Ohmite Z-144
L3	Inductor: 2004A, cathode choke	Henry L3-2004A

L4	Inductor: Input coil 146 MHz	Henry L4-2002A
L4	Inductor: Input coil 440 MHz	Henry L4-2004A
L5	Inductor: Plate choke.	Henry L5-2004A
L6	Inductor: Strip Line: ¼ wave 146 MHz	Henry L6-2002A
L6	Inductor: Strip Line: ½ wave 440 MHz	Henry L6-2004A
L7	Inductor: RF Choke	Henry L7-2004A
M1	Meter: Plate current, 0 to 600 ma movement	Beede 913105
M2	Meter: Multimeter, 0 to 1 ma movement	Beede 913104
	Metal work: Back panel	Henry
	Metal work: Cabinet top screen	Henry
	Metal work: Cabinet wrap around.	Henry
	Metal work: Front panel with anodized trim.	Henry
PL1	Pilot light: Standby light assembly bulb.	Sylvania type 330
PL1	Pilot light: Standby light holder	Compulite 621-1-B
PL2	Pilot light: Power light assembly bulb	Sylvania type 330
PL2	Pilot light: Power light assembly holder	Compulite 621-1-B
	Power Cord: 10 foot, three conductor.	Henry
R1	Resistor: Wire Wound, 20 K ohms, 20 watts	Resistor
R2-R6	Resistor: Same as R1	
R7	Resistor: Carbon, 1 ohm, 1 watt, 10%	Resistor
R8	Resistor: Wire Wound, 25 ohms, 25 watts, 5%.	Resistor
R9	Resistor: Precision, 4 M ohms, 7.5 watts, 1%	Resistor
R10	Resistor: Carbon, 10 K ohms, 1 watt, 10%	Resistor
R11	Resistor: Wire Wound, 10 K ohms, 25 watts, 5%	Resistor
R12	Resistor: Carbon 1 K ohms, 1 watt, 10%	Resistor
R13	Resistor: Carbon, 150 ohms, 2 watts, 10%	Resistor
R14	Resistor: Carbon, 5 ohms, 1 watt, 10%	Resistor
R15	Resistor: Wire Wound, 20 K ohms, 50 watts, 5%	Resistor
R16-R17	Resistor: Same as R15	
R18	Resistor: Wire Wound, 50 ohms, 50 watts, 5%.	Resistor
R19	Resistor: 2002A- .25 ohms, 10 watts, 5%.	Resistor
R19	Resistor: 2004A- .5 ohms, 10 watts, 5%.	Resistor
RY1	Relay: Warmup delay.	Amperite 115N060
RY2	Relay: 2002A Output section coaxial	Dow Key 60-222842
RY2	Relay: 2002A Input section	Guardian 1365PC-2C-12D
RY2	Relay: 2004A 2 pole double throw coaxial.	Dow Key 260B-220142
S2	Switch: FM / SSB, Rotary.	Henry S2 2004A
S3	Switch: Function, 4 pushbuttons	Switchcraft 65041K206
T1	Transformer: High Voltage / Filament.	ECA 1202
T2	Transformer: Relay Power Supply	ECA 1199
TB1	Terminal board: AC Input.	Cinch Jones 5-142
TB2	Terminal Board: RF Section	Cinch Jones 8-140
VR1	Potentiometer: Plate Meter adjust, 2.5 K ohms	Potentiometer
V1	Tube: Ceramic Triode	Eimac 3CX800A7
	Tube Socket.	Cinch 9XM



SECTION 9. WARRANTY

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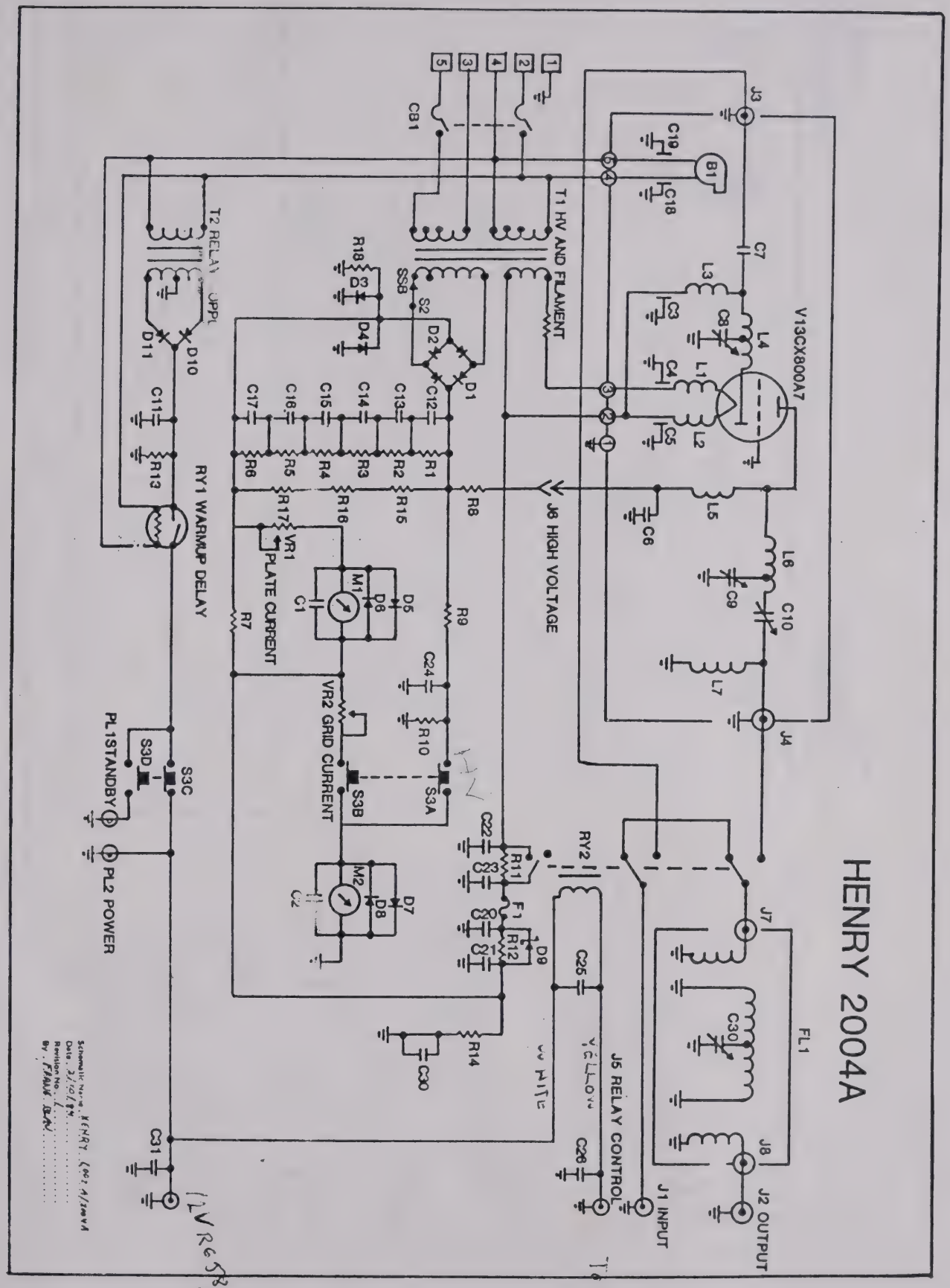
D9 1N2806A
R11 10K 25W
R12 1K 1W
F1 3AG 1.5A
.01 µf

TOM SALES

1-800-877-7979


HENRY 2004A
V13CX800A7
T1 HV AND FILAMENT
T2 RELAY
RY1 WARMUP DELAY
PLATE CURRENT
VR2 GRID CURRENT
J6 HIGH VOLTAGE
RY2
J5 RELAY CONTROL
YELLOW
WHITE
J1 INPUT
J2 OUTPUT
J3
J4
J7
J8
FL1
PL1STANDBY
PL2 POWER
CB1
B1
S3A
S3B
S3C
S3D
M1
M2
F1

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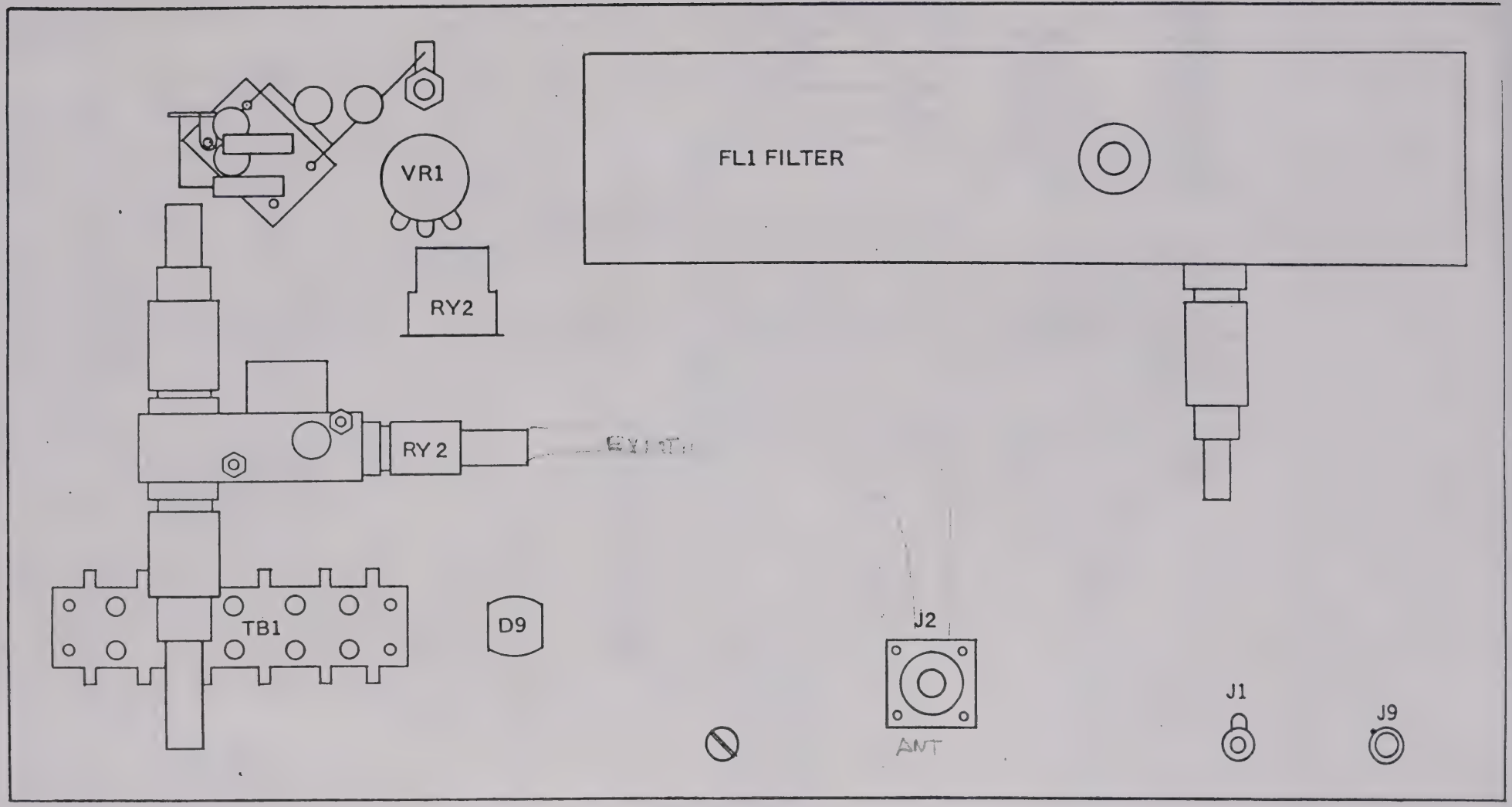
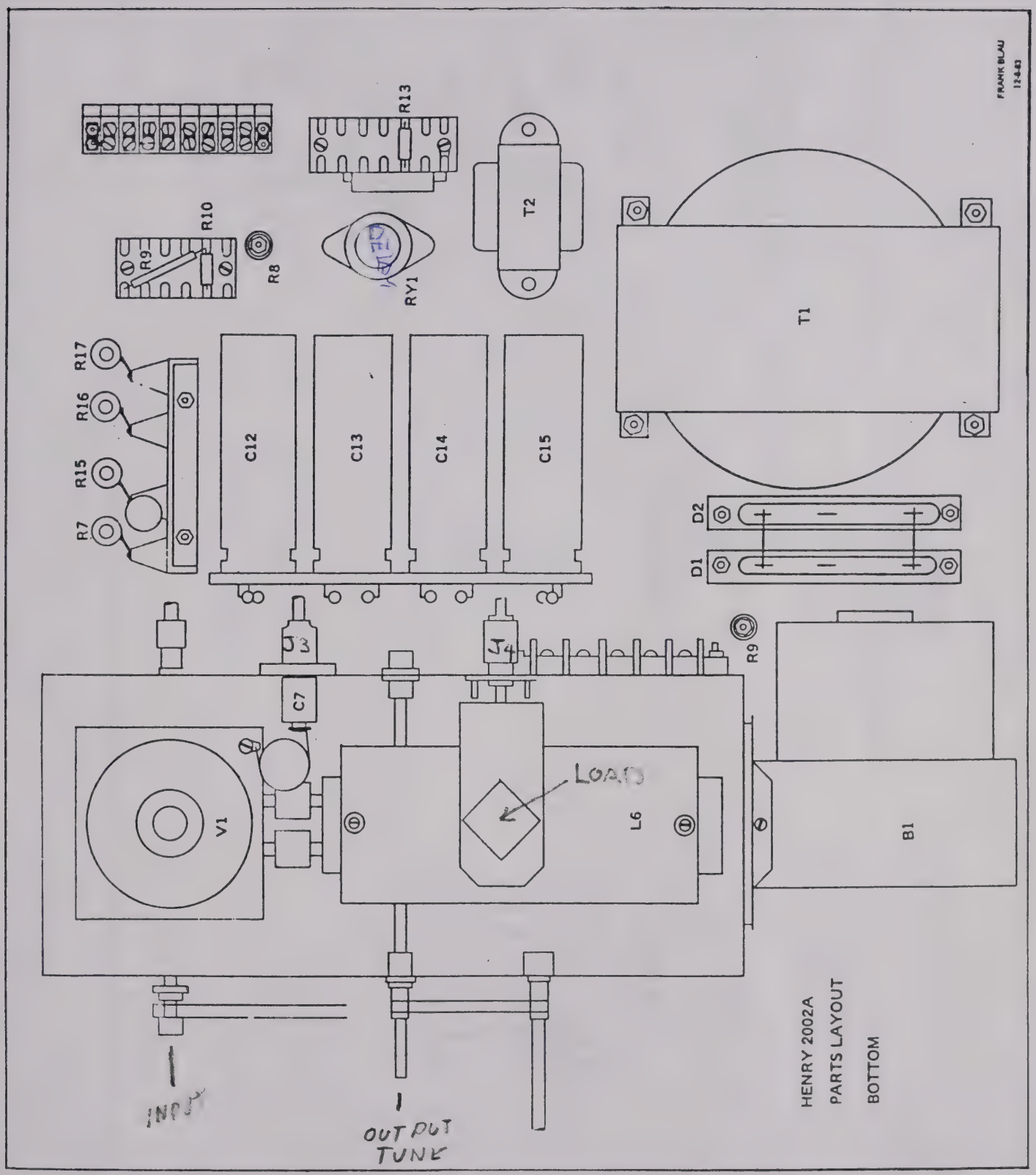
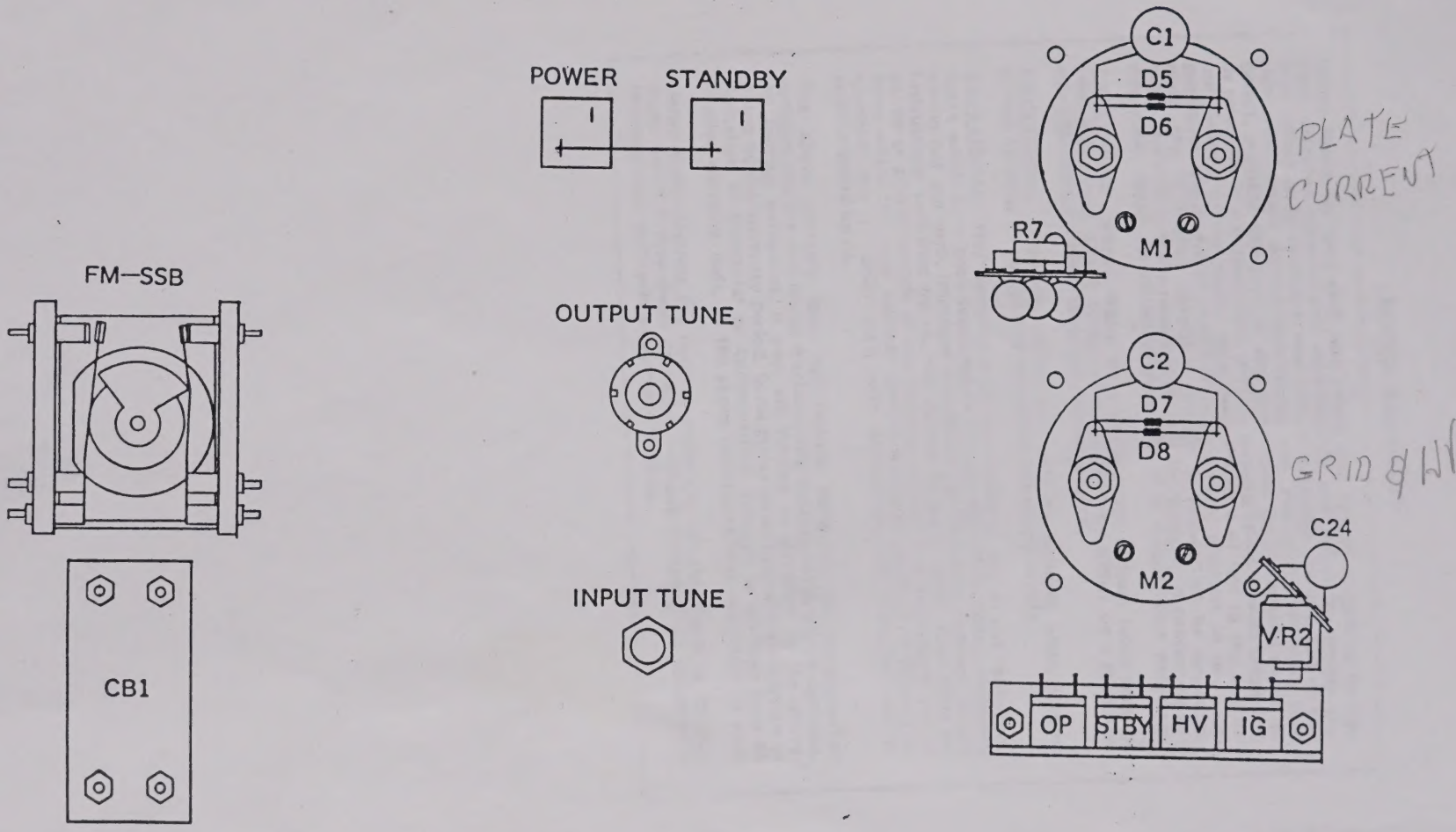


HENRY 2002A
PARTS LAYOUT
REAR

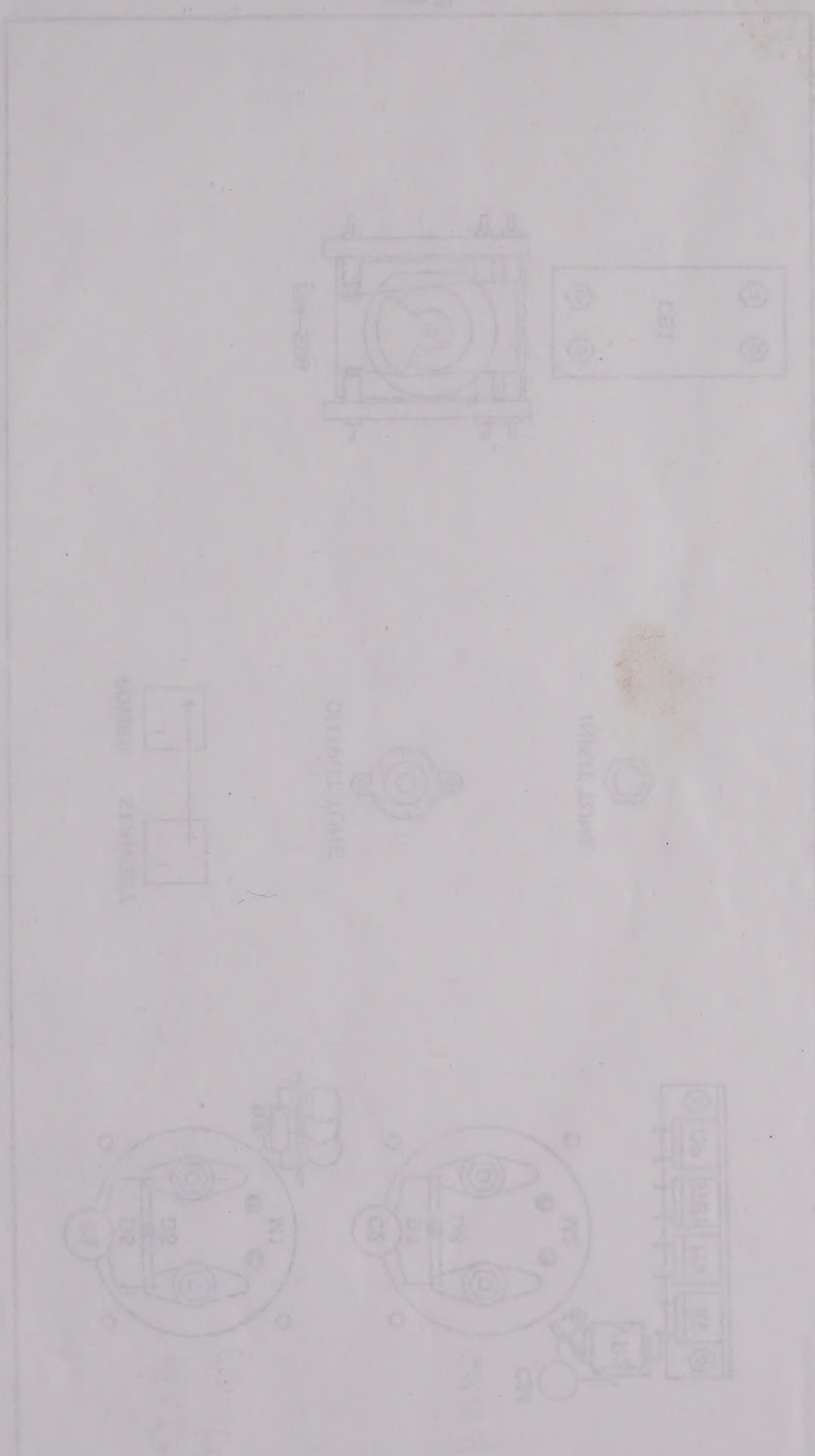
FRANK J. BLAU
12-15-83


FRANK BLAU
12-83
R13
T2
R10
R9
R8
RY1
T1
R17
R16
R15
R7
C12
C13
C14
C15
D2
D1
J3
J4
R9
C7
V1
LOAD
L6
B1
INPUT
OUTPUT
TUNE
HENRY 2002A
PARTS LAYOUT
BOTTOM



HENRY 2002A
PARTS LAYOUT
FRONT

FRANK J. BLAU
12-15-83



LIMITED WARRANTY

Henry Radio warrants each new Henry and Tempo product to be free from defective material and workmanship and agrees to remedy any such defect or to furnish a new part in exchange for any part of any unit which under normal installation, use, and service discloses such defect, provided the unit, or part is delivered by the original owner to us intact for our examination, with all transportation charges prepaid to our factory, within ninety days from the date of sale to the original purchaser and provided that such examination discloses in our judgment that it is thus defective. Should a malfunction be suspected, write in detail to our service department for suggestions concerning the operation, repair, or return of your unit if it should prove necessary.

EXCLUSION: Henry Radio does not warrant vacuum tubes used in their equipment. Eimac tubes are warranteed by Eimac on a pro-rated one year basis. All other tubes are not warranteed.

EXCLUSION: Warranty claims will only be honored when accompanied by proof of purchase which shows the purchase date.

EXCLUSION: This warranty does not extend to any of our radio products which have been subjected to misuse, neglect, accident, incorrect wiring not our own, improper installation, or to use in violation of the instructions furnished by us, nor extend to units which have been repaired or altered outside of our factory, without our permission, nor in cases where the serial number thereof has been removed or defaced or changed, nor to units used with accessories not manufactured or recommended by us.

The above warranty does not include incidental or consequential damages and the distributor disclaims any liability for any such damages. All implied warranties, if any, are limited in duration to the above-stated 90 day warranty period. Some states do not allow the exclusion or limitation of incidental or consequential damages or on how long an implied warranty lasts, so the above limitations may not apply to you.

Henry Radio reserves the right to make any improvements to its products which it may deem desireable without obligation to install such improvements in its previously sold products.

CHARLES OLIVE JR
1-951 898 4950

W6CAU
CAP